A RIBBON OF LIFE

(The New River Watershed)

A Water Resource Education Unit

CONCEPT: We all live in a watershed, it affects our lives and how we live effects it.

PURPOSE: This unit teaches students about the watershed they live in, how their actions affect the watershed, and ways to take care of it.

OBJECTIVES: Students will be able to:

1. define a watershed
2. describe the geophysical features of a watershed, especially those of the New River Watershed
3. identify how we are part of a watershed and are connected to each other within a watershed

CURRICULUM ACTIVITIES:	SUBJECT AREAS:
1. Watershed Bingo "WATER"	Language Arts
2. The New River Watershed (ranger program)	Language Arts, Geography, Science
3. Water Journal	Writing, Language Arts
4. New River Explorer	Computer Science
5. Mapping the New River Watershed	Geography
6. Water Monitoring (optional)	Science, Math

New River Gorge National River

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(The New River Watershed)

OVERVIEW

What is a watershed?

A watershed is an area of land which drains (sheds) water into a stream or river. It is also known as a drainage basin. The system of streams that transports water, sediment and other materials from a watershed is called a drainage system[2]. A watershed catches water that falls to the earth as precipitation; a drainage system channels the water and substances it carries to a common outlet[2].

The watershed is the drainage basin of a river; the area through which all waters flow from their highest source before draining naturally to the sea[3]. In the broader ecological sense, the term watershed includes not only the land and water but the mountains and forest, floodplains and valleys, as well as the communities of plants, animals and people who live there[3].

A watershed is "that area of land . . . within which all living things are inextricably linked by their common water course and where, as humans settled, simple logic demanded that they become part of the community," John Wesley Powell.

Watersheds come in all sizes and shapes depending the topography or lay of the land. Each stream or river comprises a watershed (drainage basin) and is separated from other drainage basins by divides. Divides are the highest topographical points surrounding a stream or river causing water to drain into one stream or another. In every watershed, small streams flow into larger streams, which flow into river, lakes, and bays[6]. Each of these smaller streams are tributaries of a larger mainstream river and each is a sub-watershed of a larger watershed. For example, Piney and Glade creeks and the Greenbrier and Bluestone rivers are tributaries of the New River. They are also sub-watersheds of the New River watershed.

The Hydrologic Cycle

Water is always on the move through the environment. The hydrologic cycle (water cycle) transports water between earth's watersheds, atmosphere, and oceans[2].

Rain falls upon the land and either runs off or soaks into the earth. Some of the rainwater is used by plants and animals in their life processes, some is used by humans, and some makes its way underground to be stored or to reappear at another place to feed streams and rivers. Much of it goes back into the atmosphere through evaporation and transpiration.

Clouds form and, when conditions are ripe, the water is released to earth again in the form of rain or snow.[4]

The water cycle plays an important role in resupplying water to a watershed. It is the water cycle at work through evaporation, transpiration, and precipitation that gives us the seemingly endless supply of water flowing within the New River and the New River Watershed.

People and Watersheds

Every person on Earth lives within a watershed. A watershed is our home; it is where we are born and raised, where we learn and grow, and where we work and play. Our watershed contains mountains and plateaus, valleys and gorges, forests and wildlife, as well as our yard or farm and our neighbor's woodlot.

Within our watershed we are connected to everything and everybody. It is the watershed, itself, that connects us to one another. What we do and how we treat our watershed impacts the watershed and effect things downstream. Our daily activities can have a negative impact on the quality and quantity of water available to us and other living creatures for survival.

As water is shed off the land, the soil and plants collect large amounts of water. This process prevents flooding and makes more fresh water available by slowing its flow and allowing it to seep underground. When watershed lands are stripped of vegetation or replaced with concrete or houses, the watershed can no longer function to prevent floods and replenish the freshwater supply. [5]

Water moving through the hydrologic cycle picks up pollutants left behind by our activities. In the atmosphere pollutants from factory smokestacks, car exhaust, and wood smoke are picked up as wapor vapor condenses and falls back to earth as acid rain. Rain water runoff picks up surface pollutants from farms, streets and roadways, lawns and gardens, etc. Chemical spills, leaky landfills, and illegal dumps pollute water as it moves through the ground and re-surfaces in springs and streams.

Many watersheds have been altered as a result of human needs for water, food, recreation, transportation, manufactured goods, etc. These growing demands have led to unwise land uses within watersheds that has degraded water quality in our streams and rivers. Diking, damming, and straightening of streams is done for flood control; streams are put into underground pipes to make more land available for homes, malls, and roads; streams are polluted by dumping storm-water runoff and factory and sewage treatment plant discharges[1].

Everyone living in a watershed relies on the natural resources of the watershed to exist. All life forms (plants, animals, and humans) depend on water within the watershed they live in for survival. A healthy watershed is vital for a healthy environment and economy. People must take a "watershed approach" to managing natural resources. This implies a way of looking at things as a whole, of seeing people and not just the trees but the forest, not just the river but all that creates and diminishes its flow[3]. Therefore, maintaining the water quality of a watershed is essential to maintaining life on earth.

The New River Watershed

The New River watershed covers a portion of three states — North Carolina, Virginia, and West Virginia. With it's headwaters beginning on the western slopes of the Blue Ridge Mountains in North Carolina, the New River flows approximately 320 miles to the north. Along the way, many creeks, streams, and smaller rivers empty into the New River. These tributaries and the New River make up the drainage basin of the New River watershed.

The watershed encompasses an area of 6,964.6 square miles or approximately 4,457,369.5 acres. This is an area five and a half times larger than the state of Rhode Island, 3.4 times larger than Delaware, and 1.4 times larger than the state of Connecticut. There is approximately 9,000 miles of streams and rivers in the New River watershed. A total of 114 ponds and lakes cover approximately 11,3289 acres of land within the watershed.

There are more than 165 cities, towns, and communities within the watershed. Towns with a population of 5,000-10,000 include Galax, Pulaski, and Wytheville, Virginia, and Oak Hill and Princeton, West Virginia. Boone, North Carolina, Radford and Christiansburg, Virginia, and Bluefield and Beckley, West Virginia, have populations of between 10,000-20,000. The city of Blacksburg, Virginia, has a population of over 30,000.

There are two forks of the New River in North Carolina, the south fork bubbles from the ground near the community of Blowing Rock. The north fork of the New River begins along the North Carolina/Tennesse state line near Trade, Tennesse. Both the north and south forks meander through a rural mountian farm setting. At the North Carolina/Virginia border, the two forks join and continue a northeasterly flow across the valley of Virginia. North of Pulaski, Virginia, the river has cut several gaps through the ridge and valley province of the Appalachian Mountain region.

At the West Virginia/Virginia state line, the New River leaves the mountains behind and enters the Allegheny Plateau. Over time, the New River and its tributaries in West Virginia carved the landscape of the Allegheny Plateau into the deep meandering gorges as we see today.

The New River watershed is a sub-watershed to a much larger drainage system. At Gauley Bridge, West Virginia, the New River joins with the Gauley River to form the Kanawha River, which flows into the Ohio River. At this point, Pt. Pleasant, West Virginia, the New River watershed becomes part of the Ohio River watershed. Eventually the Ohio River empties into the Mississippi River and the New River watershed becomes a part of the Mississippi River watershed, which empties into the Gulf of Mexico.

1. Firehock, Karen. *Hands On Save Our Streams: The Save Our Stream Teacher's Manual*. Gaithersburg, MD: The Izaak Walton League of America, 1994.
2. Murdoch, Tom, Martha Cheo, and Kate O'Laughin. *Streamkeeper's Field Guide*. Everett, WV: The Adopt-A-Stream Foundation, 1996.
3. *Watershed*. the TERRA (Toward Ecological Recovery & Regional Alliance) Bulletin, Thailand, July 1995.
4. *Water Cycle and Water Supply*. Washington, DC: U.S. Department of Agriculture, Forest Service, July 1967.
5. *Environmental Action: Water Conservation*. Menlo Park, CA: The Tides Center/E2: Environment and Education, 1998.
6. *Adopt-A-Salmon Family: A Watershed Education Program for Middle School Students*. U.S. Fish and Wildlife Service.

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Pre-Visit Activity

Activity **Watershed Bingo "WATER"**
Setting Classroom
Duration 45 minutes - 1 hour
Subject Area Language Arts
Skills Vocabulary, Geography
Grade Level 6-8

Objectives:

Students will be able to:
1. state the definition of words related to a watershed
2. review the meaning of geographical and topographical terms related to the New River Watershed

WV-CSO's:

Language Arts - RLA.O.6.1.01, RLA.O.6.1.03, RLA.O.7.1.01, RLA.O.8.1.01, RLA..8.1.03
Social Studies - SS.6.4.4, SS.7.4.1, SS.8.4.4

MATERIALS

1. Watershed Words Worksheet
2. Watershed bingo game boards
3. Watershed bingo game cards
4. game pieces
5. prizes (optional)

BACKGROUND

This pre-visit activity should be completed before the ranger program and other unit activities.

There are many geographical and topographical terms are associated with a watershed and reading a map. This activity will help students become familiar with terms relating to the New River Watershed. Knowledge of these terms will aid students in understanding and participating in the water resource program and other activities within this unit.

This game is played similiar to the familiar game of "BINGO."

PROCEDURES

1. Begin the activity by discussing with students the meaning of each word highlighted on the "Watershed Words Worksheet."

   or

   Give each student a copy of the "Watershed Words Worksheet" and have them identify the meaning of the words highlighted. Go over definitions with students.

   note: base each word's definitions on its context in the sentence and its relationship to the watershed.

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NOTES

PROCEDURES continued

2. Give each student a "WATER" bingo game board and some game pieces.

3. How to play:

   a. The teacher or a student selects a "Watershed Bingo Game Card" from the deck and reads the statement
or question to the class.

   b. Students must complete the statement or answer the question.

   c. If a correct answer is given, all students can cover that word on their game board with a game piece.

   d. If an incorrect answer is given, students cannot cover the word on their game board.

   e. Continue reading cards until a student calls "WATER."

      (In order to call "WATER," a student must have all words covered in a row running up, down, across, or diagonally. You can also play: cover all, four corners, or other variations of the game "bingo".)

   f. Check the game board and award a prizes.

5. Play Watershed Bingo, "WATER."

6. Repeat steps 3, 4, and 5 to play several rounds of the game.

EVALUATION

While playing Watershed Bingo, check to see if students are learning the meanings of the geographical and topographical terms as well as some of the New River Watershed features.

EXTENSION

Have students use as many of the Watershed Words as possible when writing in their water resource journal.

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Watershed Words Worksheet

Directions Read each sentence and discuss the meaning of each highlighted word as it relates to the sentence context.

A. The source of the river may be a **spring** located high in the mountains.

B. The Greenbrier River is a **tributary** of the New River and is part of the New River **Watershed**.

C. A **valley** is associated with mountain ranges and a **gorge** with a **plateau**.

D. An important component of a watershed is the **water cycle**.

E. **Floodplains** and **wetlands** are found along a river system.

F. Topographical features of the New River Watershed include the **river**, the **Appalachain Mountains**, the **Allegany Plateau**, and the New River Gorge.

G. Precipitation that falls on the New River side of the watershed **divide** will flow into the New River.

H. Bluestone Lake was created by the contruction of a **dam** on the New River.

I. The **topography** of the watershed changes as the river **meanders** from its **headwaters** in North Carolina across Virginia and into West Virginia.

J. **Landforms** on the earth's surface change in **elevation** as one travels from place to place.

K. Ridges, streams, **contour lines**, and roadways can be found on a **topographic map**.

L. Water is found in a watershed as **surface water** or **ground water**.

M. The **mouth**, **bed**, **channel,** and **bank** are parts of a river.

N. The **downstream** flow of the New River is north.

O. The **gradient** of a river creates **rapids**.

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Watershed Bingo Game Boards

New River Gorge National River

Directions Photocopy (enlarge 20%) and cut out game boards.

W	A	T	E	R
Watershed	*Channel*	*Elevation*	*Topography*	*Surface Water*
Contour	*River*	*Gorge*	*Teays River*	*Plateau*
Rapid	*Tributary*	***FREE***	*Wetland*	*North*
North Carolina	*Bluestone*	*Downstream*	*Headwaters*	*Meandering*
Valley	*Allegheny*	*New River*	*Mountain*	*Floodplain*

W	A	T	E	R
Watershed	*Headwaters*	*Elevation*	*Bluestone*	*Gorge*
Tributary	*Mountain*	*Surface Water*	*Allegheny*	*Plateau*
Rapid	*Contour*	***FREE***	*Wetland*	*Valley*
North Carolina	*Topography*	*Floodplain*	*Channel*	*Meandering*
North	*Teays River*	*New River*	*River*	*Downstream*

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Watershed Bingo Game Boards

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W	A	T	E	R
Tributary	*North*	*Spring*	*Ohio*	*Water Cycle*
West Virginia	*Allegheny*	*Bank*	*New River*	*North Carolina*
Mouth	*Downstream*	***FREE***	*Divide*	*Plateau*
Greenbrier	*Kanawha*	*Watershed*	*Appalachian*	*Bed*
Landform	*Topographic*	*Teays River*	*Elevation*	*River*

W	A	T	E	R
North Carolina	*Greenbrier*	*Mouth*	*Tributary*	*Downstream*
Ohio	*Allegheny*	*Elevation*	*Divide*	*Water Cycle*
Watershed	*Topographic*	***FREE***	*Teays River*	*Spring*
Appalachian	*North*	*Bank*	*New River*	*Plateau*
Kanawha	*West Virginia*	*River*	*Bed*	*Landform*

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Watershed Bingo Game Boards

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W	A	T	E	R
Rapid	*North Carolina*	*Mountain*	*Surface Water*	*Ground Water*
Divide	*Meandering*	*Channel*	*Watershed*	*Wetland*
Contour	*River*	***FREE***	*Topography*	*Landform*
Gorge	*Plateau*	*New River*	*Bluestone*	*North*
Headwaters	*Dam*	*Allegheny*	*Gradient*	*Tributary*

W	A	T	E	R
Tributary	*North Carolina*	*Gorge*	*Surface Water*	*Headwaters*
River	*Meandering*	*Channel*	*Watershed*	*Wetland*
Topography	*Divide*	***FREE***	*Contour*	*Landform*
Mountain	*Plateau*	*New River*	*Bluestone*	*North*
Ground Water	*Dam*	*Allegheny*	*Gradient*	*Rapid*

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W	A	T	E	R
River	*Divide*	*Spring*	*Ohio*	*Bank*
West Virginia	*Allegheny*	*Water Cycle*	*New River*	*North Carolina*
Teays River	*Landform*	***FREE***	*North*	*Plateau*
Greenbrier	*Kanawha*	*Watershed*	*Appalachian*	*Bed*
Downstream	*Topographic*	*Mouth*	*Elevation*	*Tributary*

W	A	T	E	R
Greenbrier	*North Carolina*	*Allegheny*	*Tributary*	*Downstream*
Ohio	*Mouth*	*Elevation*	*Spring*	*Water Cycle*
West Virginia	*Landform*	***FREE***	*Bank*	*Divide*
Appalachian	*North*	*Teays River*	*New River*	*Plateau*
Kanawha	*Watershed*	*River*	*Bed*	*Topographic*

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W	A	T	E	R
Appalachian	*Elevation*	*Mountain*	*Stream*	*Headwaters*
Gradient	*Meandering*	*North Carolina*	*Watershed*	*Wetland*
Spring	*Greenbrier*	***FREE***	*North*	*Plateau*
Gorge	*Landform*	*New River*	*River*	*West Virginia*
Topographic	*Dam*	*Allegheny*	*Divide*	*Tributary*

W	A	T	E	R
Wetland	*North Carolina*	*Gorge*	*Mountain*	*Dam*
River	*Greenbrier*	*Elevation*	*Watershed*	*Tributary*
West Virginia	*Divide*	***FREE***	*Spring*	*Landform*
Surface Water	*North*	*New River*	*Meandering*	*Plateau*
Topographic	*Headwaters*	*Allegheny*	*Gradient*	*Appalachian*

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W	A	T	E	R
Tributary	*Teays River*	*Spring*	*Ohio*	*New River*
Downstream	*Allegheny*	*Appalachian*	*Water Cycle*	*Greenbrier*
Mouth	*West Virginia*	***FREE***	*Divide*	*Plateau*
North Carolina	*Kanawha*	*Watershed*	*Bank*	*Bed*
Landform	*Topographic*	*North*	*River*	*Elevation*

W	A	T	E	R
Allegheny	*Greenbrier*	*Topographic*	*Divide*	*Downstream*
Ohio	*North Carolina*	*Landform*	*Tributary*	*Water Cycle*
Watershed	*Mouth*	***FREE***	*Plateau*	*Spring*
Kanawha	*Bed*	*Bank*	*New River*	*Teays River*
Appalachian	*West Virginia*	*River*	*North*	*Elevation*

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W	A	T	E	R
River	*Divide*	*Spring*	*Surface Water*	*Headwater*
Gradient	*Allegheny*	*Wetland*	*New River*	*North Carolina*
Mountain	*Landform*	***FREE***	*North*	*Plateau*
Gorge	*Greenbrier*	*Watershed*	*Appalachian*	*West Virginia*
Dam	*Topographic*	*Meandering*	*Elevation*	*Tributary*

W	A	T	E	R
Greenbrier	*North Carolina*	*Allegheny*	*Tributary*	*Dam*
New River	*Wetland*	*Elevation*	*Headwaters*	*Mountain*
West Virginia	*Landform*	***FREE***	*Spring*	*Divide*
Appalachian	*North*	*River*	*Meandering*	*Plateau*
Surface Water	*Watershed*	*Gorge*	*Gradient*	*Topographic*

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W	A	T	E	R
Tributary	*Teays River*	*Mouth*	*Ohio*	*Topography*
Downstream	*Allegheny*	*Appalachian*	*Water Cycle*	*New River*
Spring	*Gorge*	***FREE***	*Channel*	*Plateau*
North Carolina	*Kanawha*	*Surface Water*	*Bank*	*Bed*
Bluestone	*Watershed*	*North*	*River*	*Meandering*

W	A	T	E	R
Allegheny	*Gorge*	*Topography*	*Channel*	*Downstream*
Appalachian	*North Carolina*	*Bluestone*	*Plateau*	*Water Cycle*
Watershed	*Mouth*	***FREE***	*Tributry*	*Spring*
Kanawha	*River*	*Bank*	*Meandering*	*Teays River*
Ohio	*Ground Water*	*Bed*	*North*	*New River*

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W	A	T	E	R
Tributary	*North Carolina*	*Gorge*	*Ground Water*	*Headwaters*
River	*Meandering*	*Elevation*	*Watershed*	*Wetland*
West Virginia	*Divide*	***FREE***	*Spring*	*Landform*
Mountain	*Plateau*	*New River*	*Greenbrier*	*North*
Topographic	*Dam*	*Allegheny*	*Gradient*	*Appalachian*

W	A	T	E	R
Appalachian	*North Carolina*	*Mountain*	*Surface Water*	*Topographic*
Divide	*Meandering*	*Elevation*	*Watershed*	*Wetland*
Spring	*River*	***FREE***	*West Virginia*	*Landform*
Gorge	*Plateau*	*New River*	*Greenbrier*	*North*
Headwaters	*Dam*	*Allegheny*	*Gradient*	*Tributary*

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W	A	T	E	R
Gorge	*Wetland*	*Meandering*	*Topography*	*Surface Water*
Contour	*River*	*Watershed*	*Divide*	*Plateau*
Rapid	*Mountain*	***FREE***	*Channel*	*North*
New River	*West Virginia*	*Floodplain*	*Headwater*	*Gradient*
Valley	*Allegheny*	*North Carolina*	*Tributary*	*Ground Water*

W	A	T	E	R
Bluestone	*River*	*Divide*	*Rapid*	*Headwaters*
Plateau	*North Carolina*	*Valley*	*Allegheny*	*Mountain*
Ground Water	*New River*	***FREE***	*Watershed*	*Gradient*
North	*Tributary*	*Contour*	*Surface Water*	*Topography*
Floodplain	*Gorge*	*Channel*	*Meandering*	*Wetland*

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W	A	T	E	R
Tributary	*River*	*Gorge*	*Ohio*	*Topography*
Meandering	*Allegheny*	*Surface Water*	*Water Cycle*	*Kanawha*
Spring	*Mouth*	***FREE***	*Bed*	*Bluestone*
North Carolina	*New River*	*Appalachian*	*Bank*	*Channel*
Plateau	*Watershed*	*North*	*Teays River*	*Downstream*

W	A	T	E	R
New River	*Gorge*	*Topography*	*North Carolina*	*Downstream*
Meandering	*Channel*	*Bluestone*	*Mouth*	*Ground Water*
Watershed	*Plateau*	***FREE***	*Tributary*	*Spring*
Kanawha	*River*	*Ohio*	*Appalachian*	*Teays River*
Bank	*Water Cycle*	*Bed*	*North*	*Allegheny*

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W	A	T	E	R
Tributary	*Bluestone*	*Topography*	*River*	*Gorge*
Meandering	*Ohio*	*Surface Water*	*Spring*	*Watershed*
Water Cycle	*Teays River*	***FREE***	*Bed*	*Allegheny*
North Carolina	*New River*	*Appalachian*	*Bank*	*Plateau*
Channel	*Kanawha*	*North*	*Mouth*	*Downstream*

W	A	T	E	R
Meandering	*Plateau*	*North*	*Water Cycle*	*Bank*
New River	*Channel*	*Ohio*	*Mouth*	*Ground Water*
Teays River	*Gorge*	***FREE***	*Appalachian*	*Allegheny*
Kanawha	*River*	*Bluestone*	*Tributary*	*Watershed*
Downstream	*North Carolina*	*Bed*	*Topography*	*Spring*

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W	A	T	E	R
Watershed	*Headwaters*	*Floodplain*	*River*	*Gorge*
Meandering	*Mountain*	*Spring*	*Allegheny*	*Tributary*
Wetland	*Teays River*	***FREE***	*Rapid*	*Valley*
North Carolina	*Channel*	*Elevation*	*Topography*	*Plateau*
New River	*Contour*	*North*	*Bluestone*	*Downstream*

W	A	T	E	R
Watershed	*Plateau*	*North*	*Wetland*	*Floodplain*
New River	*Channel*	*Mountain*	*Downstream*	*Surface Water*
Teays River	*Contour*	***FREE***	*Elevation*	*Allegheny*
Gorge	*Valley*	*Bluestone*	*Tributary*	*Meandering*
Headwaters	*North Carolina*	*Rapid*	*Topography*	*River*

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W	A	T	E	R
Watershed	*Plateau*	*North Carolina*	*Mountain*	*Floodplain*
River	*Channel*	*Wetland*	*Downstream*	*Rapid*
Tributary	*Contour*	***FREE***	*Valley*	*Allegheny*
Gorge	*Elevation*	*Bluestone*	*Teays River*	*Meandering*
Headwaters	*North*	*Ground Water*	*Topography*	*New River*

W	A	T	E	R
New River	*Plateau*	*North Carolina*	*Mountain*	*Headwaters*
River	*Teays River*	*Valley*	*Elevation*	*Rapid*
Tributary	*Bluestone*	***FREE***	*Wetland*	*Allegheny*
Gorge	*Downstream*	*Contour*	*Channel*	*Meandering*
Floodplain	*North*	*Surface Water*	*Topography*	*Watershed*

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Watershed Bingo Game Cards

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Directions Photocopy and cut out game cards.

What do you call the point at which a stream or river flows into a larger body of water? **THE <u>MOUTH</u>**	The "wandering" action of a river as it changes its channel within the floodplain is called _____ . **<u>MEANDERING</u>**
The slope of a river or stream as it moves downstream is called what? **THE <u>GRADIENT</u>**	What do you call the low area of land along the river that holds over-flow water during a flood? **A <u>FLOODPLAIN</u>**
The direction a river or stream flows toward its mouth is called _____ _____ . **<u>DOWNSTREAM</u>**	A man-made structure built across a river backing water up to form a lake is a _____ . **<u>DAM</u>**
The primary course through which a river flows or the bed of a river is called the _____ . **<u>CHANNEL</u>**	The mouth of the New River is located in what state? **<u>WEST VIRGINIA</u>**
The bottom of a river consisting of rocks, sand, and mud is known as the _____ . **RIVER <u>BED</u>**	The ground along the edge of a river which slopes down to the water is called the _____ . **RIVER <u>BANK</u>**

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In a watershed, evaporation, precipitation, and runoff make up what natural cycle? **THE <u>WATER CYCLE</u>**	What are the lines on a topographic map that indicate changes in elevation? **<u>CONTOUR</u> LINES**
What is an area called where the water table stands at or slightly above the Earth's surface? **A <u>WETLAND</u>**	What do you call an area of land that drains (sheds) water into a stream, river, or lake? **A <u>WATERSHED</u>**
A smaller stream or river that empties into a larger stream or river is known as a _____. **<u>TRIBUTARY</u>**	Water found on the surface of the Earth in streams, rivers, lakes, and oceans is called _____ . **<u>SURFACE WATER</u>**
A continuous, natural flow of water from the ground is a _____ . **<u>SPRING</u>**	What is the beginning of a stream or river known as? **THE <u>HEADWATERS</u>**
A large channel of water that drains a watershed into an ocean, lake, or other body of water is a _____. **<u>RIVER</u>**	A stretch of river characterized by a constricted channel, faster moving water, and an increased gradient as known as a _____ . **<u>RAPID</u>**

A RIBBON OF LIFE

Watershed Bingo Game Cards

New River Gorge National River

The New River was once a much longer river that geologists call the _____. **TEAYS RIVER**	In what direction does the New River flow? **NORTH**
This river may be one of the oldest rivers in North America. **THE NEW RIVER**	What do you call the high points of land, such as mountain ridges, that form the boundary of a watershed? **THE DIVIDE**
An elongated lowland between ranges of mountains often having a river or stream flowing along the bottom is a _____ . **VALLEY**	What term describes the three-dimensional shape of the land surface within a watershed? **TOPOGRAPHY**
What type of map shows contour lines, elevations, and landforms? **TOPOGRAPHIC MAP**	The height of a location or landform above sea level is its _____ . **ELEVATION**
An elevated and comparatively level expanse of land is called a _____. **PLATEAU**	What name is given to a V-shaped landform cut in the Earth's surface by a river or stream? **A GORGE**

A RIBBON OF LIFE

Watershed Bingo Game Cards

New River Gorge National River

What mountain range does the New River cut through as it flows in a northward direction? **APPALACHIAN MTNS.**	What is the name of the plateau that the New River has cut a V-shaped gorge through? **ALLEGHANY PLATEAU**
The New River Watershed is part of a larger watershed known as the _____ _____ . **OHIO WATERSHED**	At the town of Gauley Bridge, WV, the New River merges with the Gauley River to form the _____ _ _____ . **KANAWHA RIVER**
The headwaters of the New River begin in what state? **NORTH CAROLINA**	What do you call a landform that has been pushed up from the Earth's surface and has steep slopes, peaks, and ridges. **MOUNTAINS**
Features on the Earth's surface such as mountains, valleys, plateaus, gorges and floodplains are known as _____. **LANDFORMS**	What major tributary of the New River is named for a brier that grows along its banks? **GREENBRIER RIVER**
What tributary of the New River is named for the blue-colored rocks found at its headwaters? **BLUESTONE RIVER**	In a watershed, water that seeps into the ground and remains there is called _____ _____ . **GROUND WATER**

A RIBBON OF LIFE

Post-Visit Activity

Activity **Water Journal**
Setting Homework or Classroom
Duration 10-15 minutes
Subject Area Language Arts, Writing
Skills Thinking, Writing, Sentence structure
Grade Level 6-8

Objectives:

Students will be able to:
1. keep a log of what they are learning about water resources
2. express their feelings about water resources
3. describe how they can integrate what they have learned in the water resource curriculum into their personal lives

WV-CSOs:

Language Arts - RLA.O.6.1.06, RLA.O.6.2.03, RLA O.7.2.05, RLA.O.8.2.05
Science - SC.O.6.1.06, SC.O.6.2.09, SC.O.7.1.06, SC.O.8.1.08, SC.O.8.2.26

MATERIALS

1. notebook or writing pad
2. pen

BACKGROUND

The water journal allows students an opportunity to reflect on and record what they are learning about their water resources. Students can also use the journals to express their personal thoughts and feeling about Earth's water resources and how their lives are impacted by what happens to the water around them.

This activity is most effective if conducted at the end of the week. Other activities within the unit will be completed and students can incorporate the information learned through all the activities into thoughtful writings.

Students should be encouraged to follow proper writing styles, sentence structure, and grammar when making entries in their journals.

PROCEDURES

1. Have each student create their own journal to permit personal style and creativity.

2. Have students write daily or weekly to record their thoughts on the day or week's water resource program and related activties.

NOTES

PROCEDURES continued

3. Have students address the following items when recording their thoughts:

    1. What concepts did he/she learn from this week's water resource program and activities.

    2. Which of the water resource activities did he/she enjoy and why.

    3. From what I learned this week, I can have a positive impact on our water resources by making these changes in my personal life.

NOTE:

Have students fill up the front and back of each page with their writings (they do not have to start a new page for each entry.) This will save paper.

EVALUATION

Periodically evaluate and grade each student's journal based on content, sentence structure and grammar.

EXTENSION

Encourage students to integrate self-expression and creativity in their journals through poetry, song writing, art work or an article for a newpaper.

A RIBBON OF LIFE
Post-Visit Activity

Activity **New River Explorer**
Setting Homework or Classroom
Duration 1 hour
Subject Area Computer Science
Skills Research, Reading, Public speaking
Grade Level 6-8

Objectives:

Students will be able to:
1. research watershed features using the internet
2. learn about places and features of the watershed
3. report on their research

WV-CSOs:

Language Arts - RLA.O.6.2.08, RLA.O.6.2.10, RLA.O.6.3.01, RLA.O.7.2.04, RLA.O.7.2.07, RLA.O.7.2.10, RLA.O.8.2.08, RLA.O.8.2.09, RLA.O.8.3.01, RLA.O.8.3.02

MATERIALS

1. computer and internet access
2. Watershed Websites
3. paper and pencil
4. appropriate state or county maps

BACKGROUND

This activity will allow students to explore and learn more about the New River watershed. Through the internet, students can access information about places and features of the watershed. The information will assist them in better understanding the watershed in which they live. It might even spark an interest to visit other parts of the watershed.

Students have access to the internet at school, home and at public libraries.

PROCEDURES

1. Give each student a place or website from the "Watershed Website" page and have them research the palce or site on the internet at school or home.

2. Students should gather the following information while visiting their website.

   a. place or feature name.
   b. its location and how to get to it (may need to use sate and county maps to find out how to get there).
   c. its cultural, natural, or ecomonic significants.
   d. activities/products offered

3. Have each student prepare and present to the class a 2-3 minute summary on his or her website.

NOTES

EVALUATION

Have each student turn in a brief summary of his or her web site.

EXTENSION

As a class, students can gather brochures, pictures, and other literature for areas visited on the internet and make a watershed exhibit.

A RIBBON OF LIFE
Watershed Websites

New River Gorge National River

Upper New River	http://cfpub.epa.gov/surf/huc.cfm?huc_code=05050001
Middle New River	http://cfpub.epa.gov/surf/huc.cfm?huc_code=05050002
Greenbrier River	http://cfpub.epa.gov/surf/huc.cfm?huc_code=05050003
Lower New River	http://cfpub.epa.gov/surf/huc.cfm?huc_code=05050004
American Heritage River	www.epa.gov/rivers/98rivers/new.html
New River Community Parteners	www.nrcp.org
New River Gorge National River	www.nps.gov/neri
Bluestone Lake	www.lrh.usace.army.mil/projects/lakes/bln/
Appalachian National Scenic Trail	www.appalachiantrail.org/hike
Blue Ridge Parkway	www.nps.gov/blri
Jefferson National Forest	www.southernregion.fs.fed.us/gwj/
Summers County, West Virginia	www.summerscvb.com
Grayson County, Virginia	www.horace.ls.net/~grayson/
Ashe County, North Carolina	www.ashechamber.com/newriver.html
New River State Park	www.ils.unc.edu/parkproject/visit/neri/home.html
Mt. Jefferson State Natural Area	www.ils.unc.edu/parkproject/moje/home.html
Claytor Lake State Park	www.dcr.state.va.us/parks/claytor.htm
New River Trail State Park	www.dcr.state.va.us/parks/newriver.htm
Shot Tower Historical State Park	www.dcr.virginia.gov/parks/shottowr.htm
Grayson Highland State Park	www.dcr.state.va.us/parks/graysonh.htm
Fort Arbuckle Archealogical Site	www.greenbrierhistorical.org/fort.html
John Henry Tunnel	www.summerscvb.com/henry.htm

National Radio Observatory	www.gb.nrao.edu
Pearl Buck Historic Site	www.myweb.wvnet.edu/~omb00996
Hawks Nest State Park	www.hawksnestsp.com
Babcock State Park	www.babcocksp.com
Bluestone State Park	www.bluestonesp.com
Pipestem Resort State Park	www.pipestemresort.com
Cass Scenic Railroad State Park	www.cassrailroad.com/
Droop Mountain State Park	www.droopmountainbattlefield.com/
Watoga State Park	www.watoga.com
Pinnacle Rocks State Park	www.pinnaclerockstatepark.com/
Raleigh County, West Virginia	www.raleighcounty.com/
Fayette County, West Viginia	www.fayettecounty.com/
Greenbrier County, West Virginia	www.greenbrierwv.com/
Pocahontas County, West Virginia	pocahontascountywv.com/

A RIBBON OF LIFE

Post-Visit Activity

Activity **Mapping the New River Watershed**
Setting Classroom
Duration 1 hour
Subject Area Geography
Skills Geography, map reading, scale and distance, team work
Grade Level 6-8

Objectives:

Students will be able to:
1. locate places and features on state and local maps
2. map in places and features on a New River Watershed map

WV-CSOs:
Social Studies - SS.6.4.2, SS.6.4.4, SS.7.4.1, SS.7.4.2, SS.7.4.3, SS.7.4.8, SS.7.4.10, SS.8.4.4, SS.8.4.9
Science - SC.O.6.1.08, SC.O.7.1.08, SC.O.7.7.28

MATERIALS

1. New River Watershed map
2. NC, VA, WV state maps
3. New River Gorge NR brochure
4. "Mapping the New River Watershed" Worksheet
5. "Topographic Map" Worksheet
6. topographic maps for Hinton, Meadow Creek., Prince, Thurmond, and Fayetteville
7. colored pencils or pens

BACKGROUND

The New River Watershed covers a large area of land in North Carolina, Virginia and West Virginia. Within the watershed are many towns and communities, historical resources, and natural and geographical features. Each of these are a part of the watershed, some affect the watershed through their activities while others are affected by activities that occur within the watershed.

Students, living within and interacting with the New River Watershed, should learn about various components within the watershed and where they are located. By doing so, they can better understand the extent and complexity of their watershed, the resources associated with it, and how each part of the watershed is interconnected by the New River, a "ribbon of life".

This activity allows students to explore their watershed using different types of maps and develop their own map of the New River Watershed.

PROCEDURES

Mapping the watershed

1. Divide the class into groups of 3-4 students.

NOTES

PROCEDURES continued

2. Provide each group with a "New River Watershed Map", state maps, a New River Gorge brochure and a copy of the "Mapping the New River Watershed Worksheet".

3. Using the different maps, have students locate the items listed on the "Mapping the New River Watershed Worksheet" and plot them on their "New River Watershed Map".

Reading a topograhic map

4. Give each group one of the topographic maps and a "Topographic Map Worksheet".

5. Using the topographic map, students should locate the items listed the "Topographic Map Worksheet".

6. Once the students are familiar with the topographic map, have them answer the questions found on the "Topographic Map Worksheet".

EVALUATION

Make sure the students completely identify and plot each item on their "New River Watershed Map". Go over the questions on the "Topographic Map Worksheet" to see if students have the correct answers (answers may vary from group to group because the topographic maps are different.)

EXTENSION

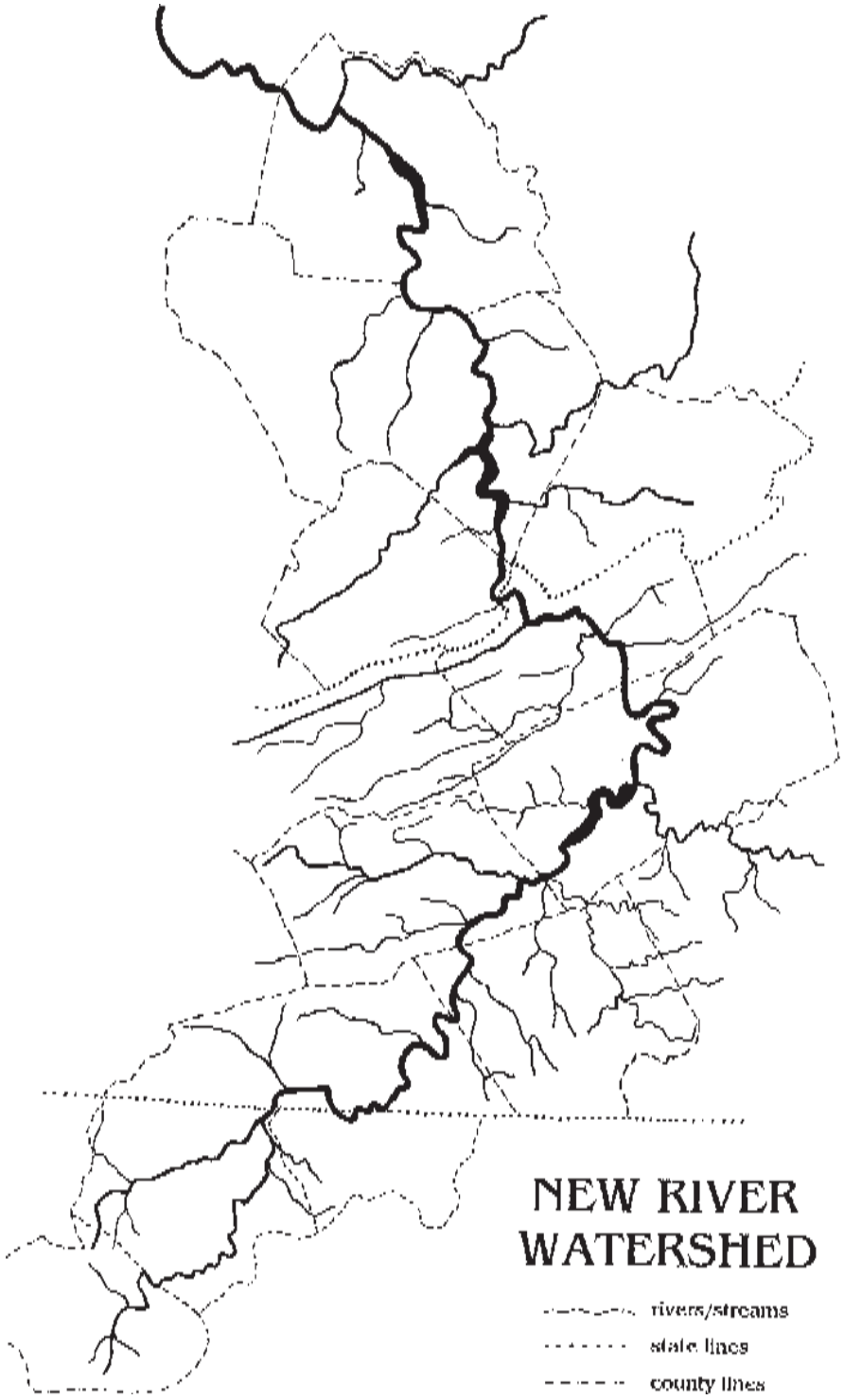
Ask students to research some of the natural features, historic resources or towns and communities within the New River Watershed and report on them to the class. Encourage them to bring in brochures, pictures or articles about different places or features within the watershed.

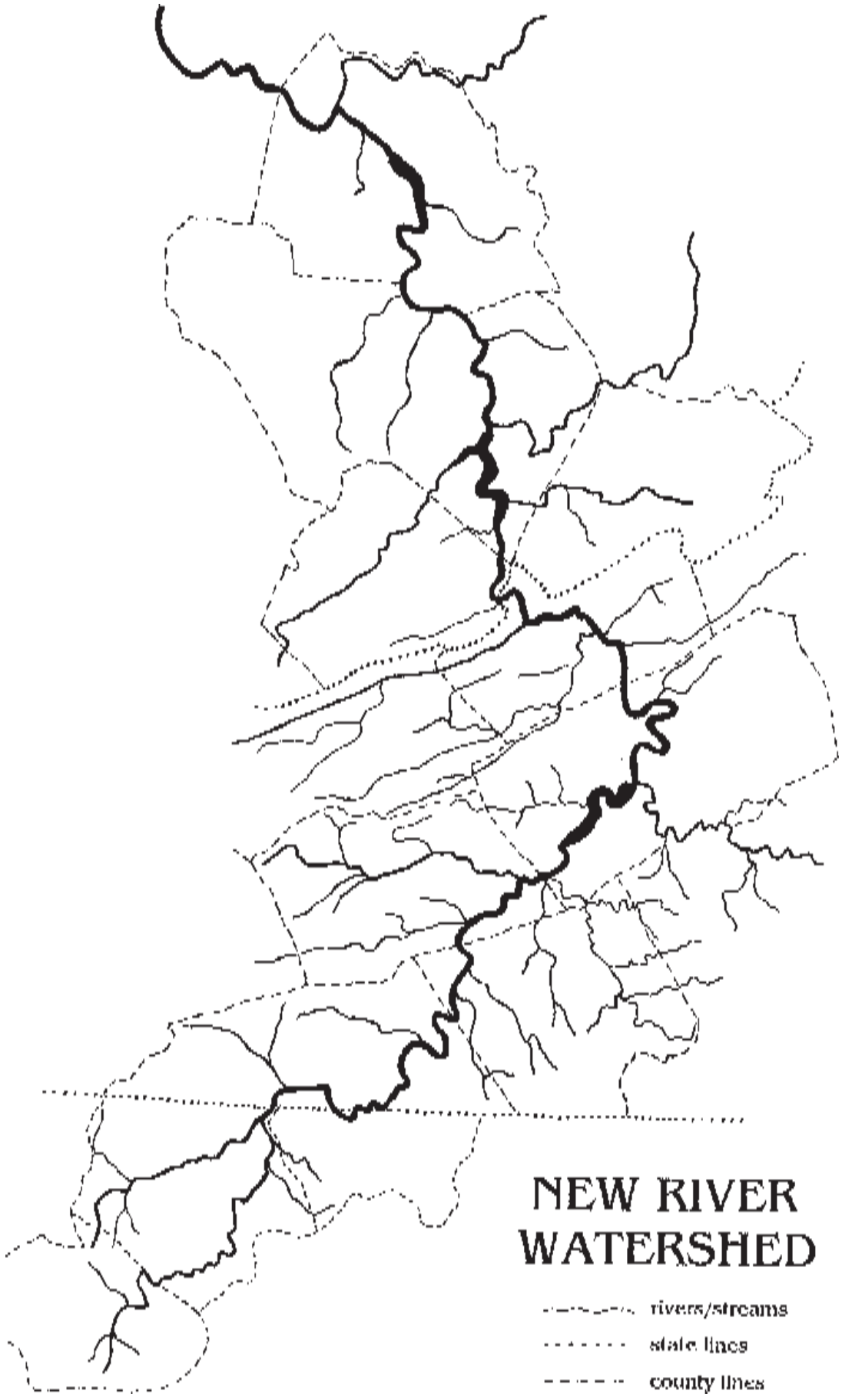
A RIBBON OF LIFE

New River Watershed Map

New River Gorge National River

Directions Enlarge to fit on 11" x 17" paper and photocopy




NEW RIVER
WATERSHED
rivers/streams
state lines
county lines

A RIBBON OF LIFE

Mapping the New River Watershed Worksheet

Directions Using the different maps, locate each item below and plot it on the "New River Watershed Map".

a. The direction of "North"

b. The New River and its forks
- South Fork of the New River
- North Fork of the New River

c. States of (highlight state boundaries in orange)
- North Carolina
- Virginia
- West Virginia

d. Counties within the watershed

e. Lakes on the New River (outline in blue)
- Claytor Lake
- Bluestone Lake
- Hawks Nest Lake

f. Major tributaries
- Bluestone River
- Greenbrier River

g. Sandstone Falls

h. Towns on the New River (mark in red)
- Boone, NC
- Jefferson, NC
- Mouth of Wilson, VA
- Radford, VA
- Narrows, VA
- Hinton, WV
- Thurmond, WV
- Gauley Bridge, WV

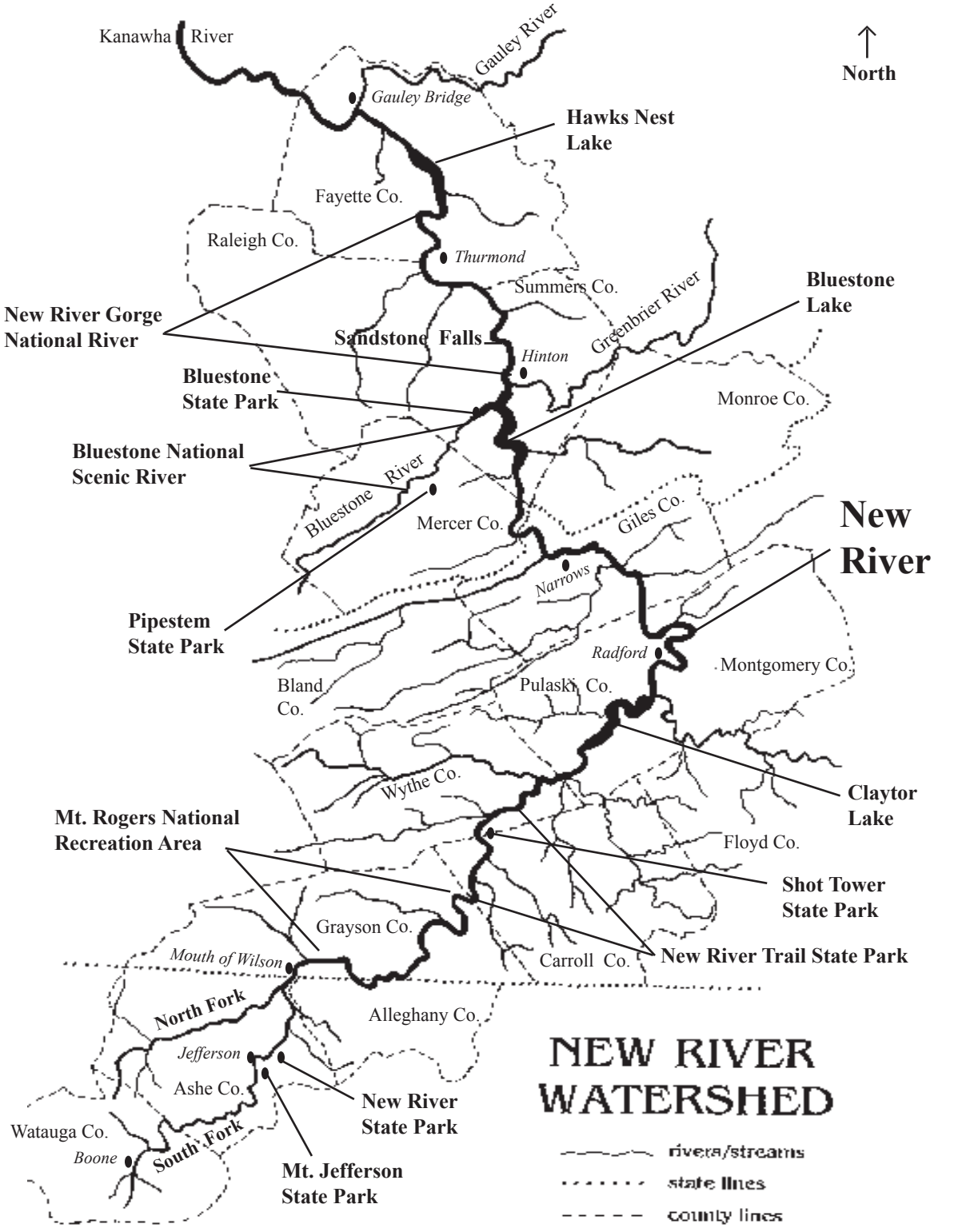
i. Parks in the watershed (color in green)
- New River Gorge National River
- New River Trail State Park
- New River State Park
- Bluestone National Scenic River
- Pipestem State Park
- Bluestone State Park
- Shot Tower State Park
- Mt. Rogers Nat'l Recreation Area
- Mt. Jefferson State Park

A RIBBON OF LIFE

New River Watershed Map Key

Water Resource Education

New River Gorge National River



A RIBBON OF LIFE

Topographic Map Worksheet

Directions Using the topographic maps, locate each item listed below on the map and answer the questions.

List:

a. contour line
b. ridge line
c. tributary
d. the scale
e. an island
f. a roadway
g. a cemetery
h. north
i. strip mine
j. hill or mountain top
k. pond or lake
l. the New River

Questions:

1. What is the name of your topographic map? _____
2. What agency produced the topographic map? _____
3. By reading the map scale, two and 5/8 inches is equal to what? _____
4. How many feet are between each contour line? _____ feet
5. Using the contour lines, what is the elevation of the New River at the center of the map? _____ feet
6. Name two tributaries listed on the map that empty into the New River.

   _____ and _____
7. What county or counties does your map cover? _____
8. What is the highest elevation found on your map? _____ feet
9. List the names of two towns shown on the map. _____
10. What is the difference in elevation between the highest point on the map and the elevation of the New River at the center of the map?

    _____ feet

Water Resource Education
New River Gorge National River

A RIBBON OF LIFE
Topographic Map Answer Key

Questions:

1. What is the name of your topographic map? name of map is in top left corner

2. What agency produced the topographic map? United States Geological Survey

3. By reading the map scale, two and 5/8 inches is equal to what? one mile

4. How many feet are between each contour line? 40 feet

5. Using the contour lines, what is the elevation of the New River at the center of the map? elevation of river will vary with each map

6. Name two tributaries listed on the map that empty into the New River.

   any two rivers, streams or creeks will be correct

7. What county or counties does your map cover?

   counties include Mercer, Summers, Raleigh and Fayette

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9. List the names of two towns shown on the map. any two towns will be correct

10. What is the difference in elevation between the highest point on the map and the elevation of the New River at the center of the map?

    take the answer to #8 and subtract the answer to #5

A RIBBON OF LIFE

Resource Page — Contour Lines

1. Contour lines represent an increase or decrease in elevation of the earth's topography included on the topographic map.

2. There is normally a forty feet elevation difference between each contour line. The contour interval for each map is given on the bottom margin of the map.

3. All points on an individual contour line have the same elevation.

4. Contour lines never intersect or cross. They will merge together at a point that represents a vertical or overhanging cliff.

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6. Contour lines bend up valleys to form V's which point upstream.

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8. Evenly spaced contour lines indicate a uniform slope while uneven spacing indicates a gentle slope.

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10. Every fifth contour line lists, at intervals along its length, the elevation of that contour line.

11. The land on one side of a contour line is higher than the line and the land on the other side of the line is lower.

A RIBBON OF LIFE

Post-Visit Activity

Activity **Mapping the New River Watershed**
Setting Classroom
Duration 1 hour
Subject Area Geography
Skills Geography, map reading, scale and distance, team work
Grade Level 6-8

Objectives:

Students will be able to:
1. locate places and features on state and local maps
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NOTES

PROCEDURES continued

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A RIBBON OF LIFE

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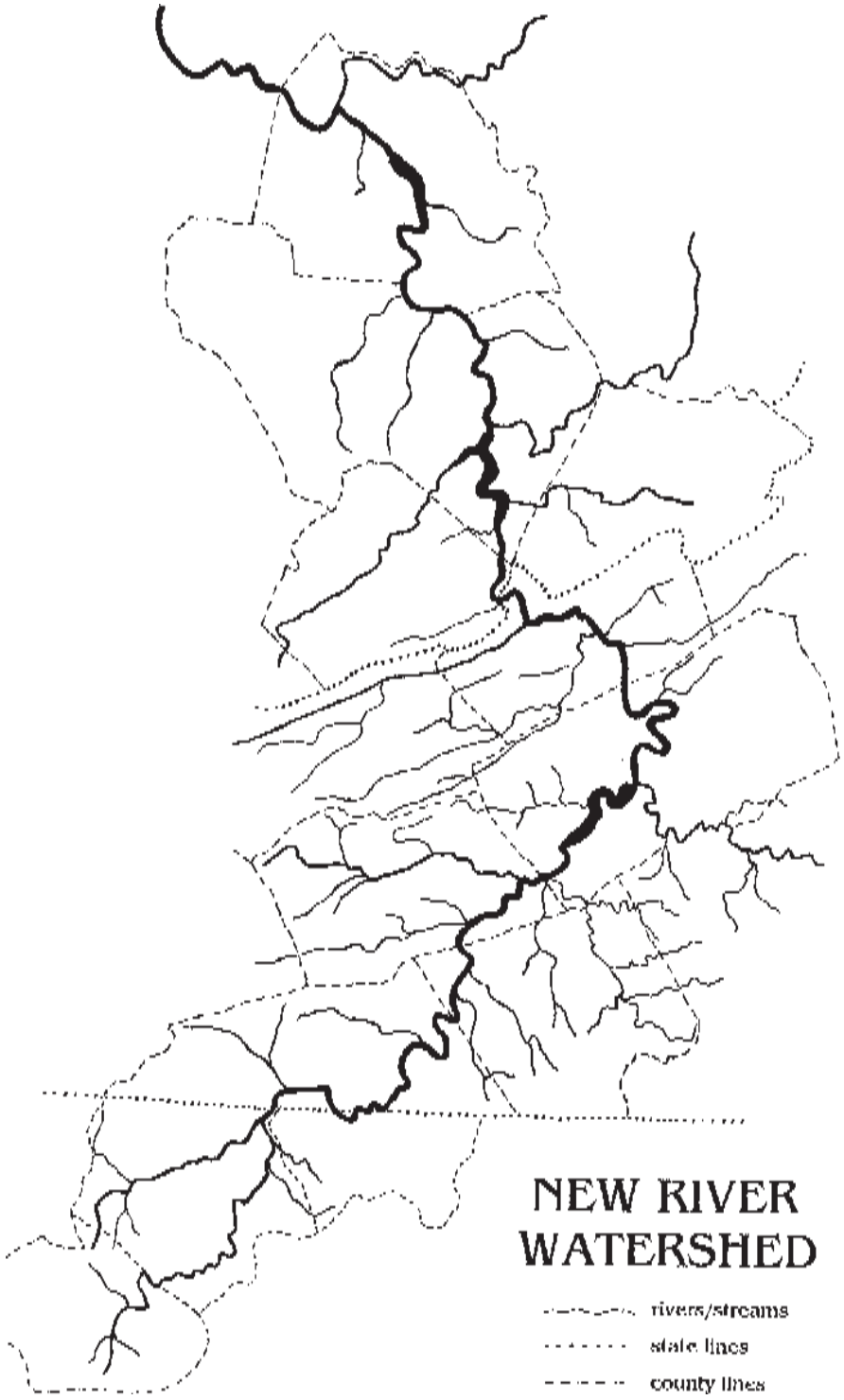

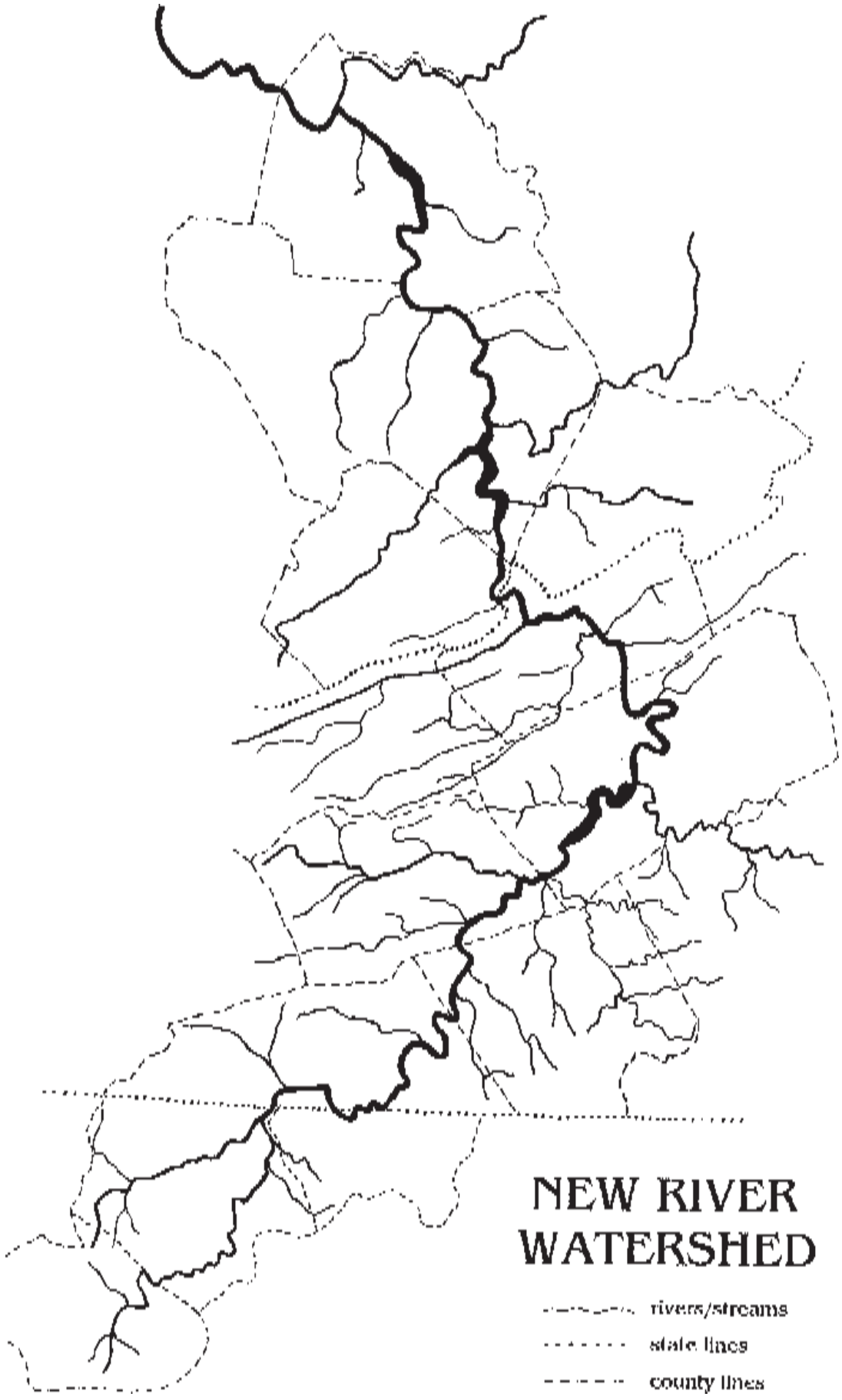
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rivers/streams
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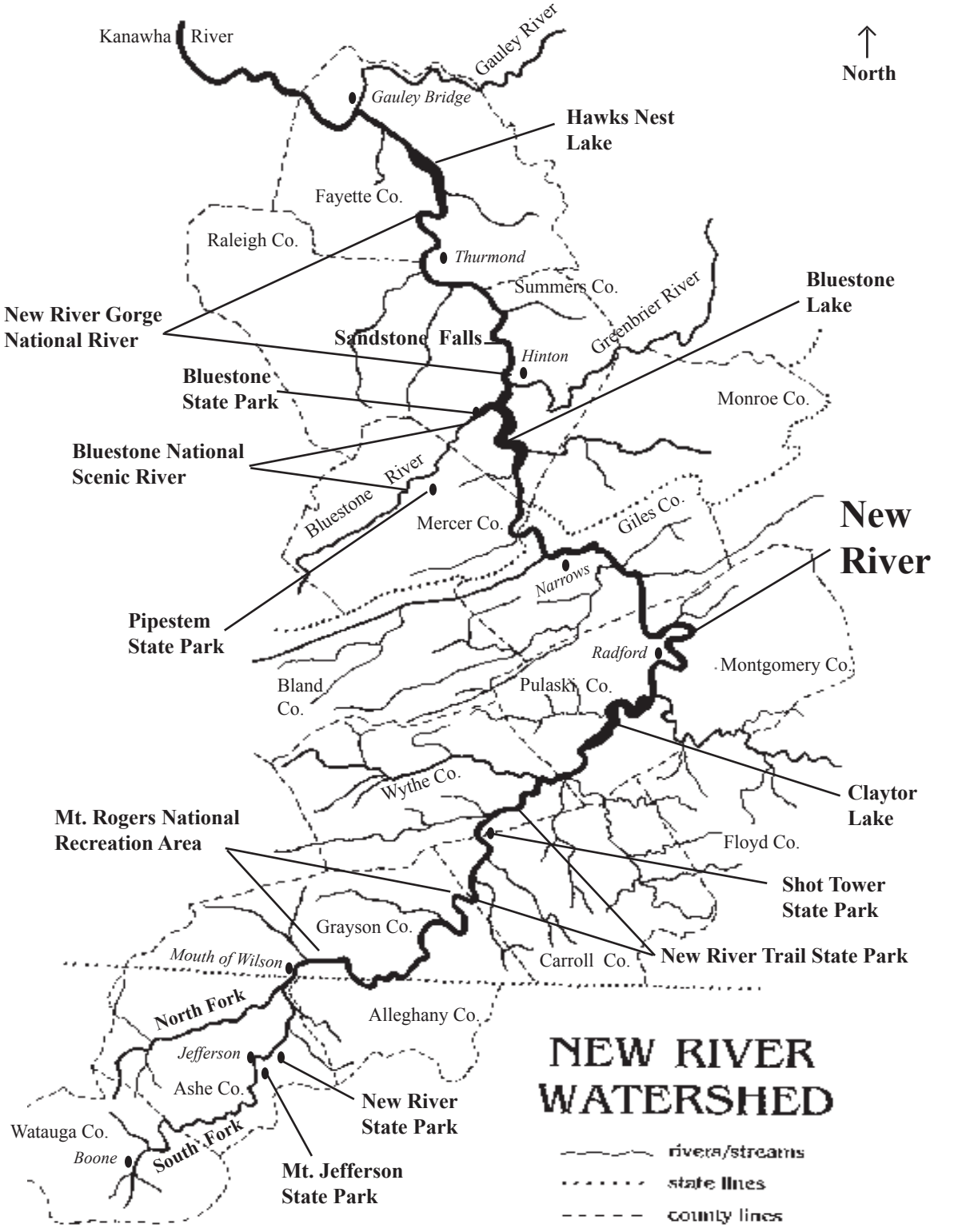
A RIBBON OF LIFE

New River Watershed Map Key

Water Resource Education

New River Gorge National River



A RIBBON OF LIFE

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    _____ feet

Water Resource Education
New River Gorge National River

A RIBBON OF LIFE
Topographic Map Answer Key

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A RIBBON OF LIFE

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A RIBBON OF LIFE

Post-Visit Activity (optional)

Activity	**Water Monitoring**
Setting	Classroom or along a river or stream
Duration	1 hour
Subject Area	Science and Math
Skills	Data collection, Recording, Graphing, Technical equipment use
Grade Level	6-8

Objectives:

Students will be able to:
1. perform several water quality tests
2. collect and record data about water quality
3. chart data on a graph

WV-CSOs:

Math - M.O.6.5.1, M.O.7.5.3, M.O.8.5.3
Science - SC.O.6.1.06, SC.O.6.1.08, SC.O.6.1.09, SC.O.6.1.11, SC.O.6.1.12, SC.O.6.2.09, SC.O.6.2.12, SC.O.7.1.06, SC.O.7.1.08, SC.O.7.1.09, SC.O.7.1.11, SC.O.7.1.12, SC.O.7.2.14, SC.O.8.1.04, SC.O.8.1.05, SC.O.8.1.06, SC.O.8.1.08, SC.O.8.2.26

MATERIALS

Refer to the equipment and materials list for this activity found in the "Water Monitoring" Unit .

BACKGROUND

Water quality is affected directly and indirectly by everything that happens within a watershed. Activities including logging, construction, agriculture, industry, and mining can have a significant impact on the quality of water within the watershed. Water quality is also affected by the daily activities of individuals, neighborhoods, towns, and communities.

Monitoring water quality is necessary in establishing baseline conditions within a river or stream. It also provides a way to determining significant changes and problems, temporary or long-term, in water quality.

This activity allows students to perform several water quality tests on samples taken from a local stream or river. They will collect data, record their findings, graph the data, and track their findings over several weeks to determine the quality of the water being tested. At the end of this data gathering period, they should be able to note any temporary changes that have occurred in the stream or river.

PROCEDURES

Procedures to conduct this activity can be found in the "Water Monitoring Unit.

Water Resource Education
New River Gorge National River

A RIBBON OF LIFE
Unit Quiz — A

New River Gorge National River

1. What is an area of land that sheds or drains water into a stream, river, or lake?	A. mountain C. drainage shed	B. river D. watershed
2. The New River flows in which general direction?	A. north C. east	B. south D. southeast
3. In what watershed do we live?	A. Missouri River C. Colorado River	B. New River D. Yukon River
4. Everyone lives in a watershed.	A. true	B. false
5. Where is the headwaters of the New River located?	A. Virgina C. Ohio	B. South Carolina D. North Carolina
6. Maintaining a healthy watershed starts at home through wise use of the land we own.	A. true	B. false
7. In West Virginia, the New River cut a V-shaped ____ through the Alleghany Plateau.	A. valley C. railroad	B. gorge D. waterfall
8. At its mouth, the New River joins the Gauley River to form what river?	A. Ohio River C. Kanawha River	B. Bluestone River D. Mississippi River
9. What is the name of the National Park located along the New River in West Virginia?	A. New River Gorge National River B. Harpers Ferry National Historical Park	
10. People do not affect the watershed in which they live.	A. true	B. false

A RIBBON OF LIFE
Unit Quiz — B

New River Gorge National River

1. In what watershed do we live?
   A. Missouri River B. New River
   C. Colorado River D. Yukon River

2. The New River flows in which general direction?
   A. north B. south
   C. east D. southeast

3. People do not affect the watershed in which they live.
   A. true B. false

4. What is the name of the National Park located along the New River in WV?
   A. New River Gorge National River
   B. Harpers Ferry National Historical Park

5. Everyone lives in a watershed.
   A. true B. false

6. Where are the headwaters of the New River located?
   A. Virgina B. South Carolina
   C. Ohio D. North Carolina

7. What is an area of land that sheds or drains water into a stream, river, or lake?
   A. mountain B. river
   C. drainage shed D. watershed

8. In West Virginia, the New River cut a V-shaped ____ through the Alleghany Plateau.
   A. valley B. gorge
   C. railroad D. waterfall

9. At its mouth, the New River joins the Gauley river to form what river?
   A. Ohio River B. Bluestone River
   C. Kanawha River D. Mississippi River

10. Maintaining a healthy watershed starts at home through wise use of the land we own.
    A. true B. false

A RIBBON OF LIFE
Unit Quiz — (Answer Key)

New River Gorge National River

Quiz A

1. D. watershed
2. A. north
3. B. New River
4. A. true
5. D. North Carolina
6. A. true
7. B. gorge
8. C. Kanawha River
9. A. New River Gorge National River
10. B. false

Quiz B

1. B. New River
2. A. north
3. B. false
4. A. New River Gorge National River
5. A. true
6. D. North Carolina
7. D. watershed
8. B. gorge
9. C. Kanawha River
10. A. true

Unit 1 and 2 Quiz - A

New River Gorge National River

1. What is an area of land that sheds or drains water into a stream, river, or lake?	A. mountain C. tributary	B. river D. watershed
2. Water is important because all living things need it to _____ .	A. swim in C. cook	B. survive D. make paper
3. In what watershed do we live?	A. Missouri River C. Colorado River	B. New River D. Yukon River
4. What percentage of earth's freshwater is readily available for our use?	A. .6% C. 6%	B. 1.6% D. 66%
5. Everyone lives in a watershed.	A. true	B. false
6. Where is the headwaters of the New River located?	A. Virgina C. Ohio	B. South Carolina D. North Carolina
7. Water is not a limited and precious resource.	A. true	B. false
8. Water is a clear liquid that is _____, _____, and tasteless.	A. colorless C. odorless	B. weightless D. a. and c.
9. Maintaining a healthy watershed starts at home through wise use of the land we own.	A. true	B. false
10. Taking shorter showers or installing a low-flow showerhead will conserve water.	A. true	B. false

Unit 1 and 2 Quiz - B

New River Gorge National River

1. Where is the headwaters of the New River located?	A. Virgina C. Ohio	B. South Carolina D. North Carolina
2. Water is not a limited and precious resource.	A. true	B. false
3. Water is a clear liquid that is _____, _____, and tasteless.	A. colorless C. odorless	B. weightless D. a. and c.
4. Everyone lives in a watershed.	A. true	B. false
5. Maintaining a healthy watershed starts at home through wise use of the land we own.	A. true	B. false
6. Taking shorter showers or installing a low-flow showerhead will conserve water.	A. true	B. false
7. What is an area of land that sheds or drains water into a stream, river, or lake?	A. mountain C. tributary	B. river D. watershed
8. Water is important because all living things need it to _____ .	A. swim in C. cook	B. survive D. make paper
9. In what watershed do we live?	A. Missouri River C. Colorado River	B. New River D. Yukon River
10. What percentage of earth's freshwater is readily available for our use?	A. .6% C. 6%	B. 1.6% D. 66%

Unit 1 and 2 Quiz - C

New River Gorge National River

1. Water is a clear liquid that is _____, _____, and tasteless.	A. colorless C. odorless	B. weightless D. a. and c.
2. In what watershed do we live?	A. Missouri River C. Colorado River	B. New River D. Yukon River
3. Maintaining a healthy watershed starts at home through wise use of the land we own.	A. true	B. false
4. What percentage of earth's freshwater is readily available for our use?	A. .6% C. 6%	B. 1.6% D. 66%
5. Taking shorter showers or installing a low-flow showerhead will conserve water.	A. true	B. false
6. Everyone lives in a watershed.	A. true	B. false
7. What is an area of land that sheds or drains water into a stream, river, or lake?	A. mountain C. tributary	B. river D. watershed
8. Water is important because all living things need it to _____ .	A. swim in C. cook	B. survive D. make paper
9. Where is the headwaters of the New River located?	A. Virgina C. Ohio	B. South Carolina D. North Carolina
10. Water is not a limited and precious resource.	A. true	B. false

Unit 1 and 2 Quiz - D

New River Gorge National River

1. Maintaining a healthy watershed starts at home through wise use of the land we own.	A. true	B. false
2. Taking shorter showers or installing a low-flow showerhead will conserve water.	A. true	B. false
3. Everyone lives in a watershed.	A. true	B. false
4. Where is the headwaters of the New River located?	A. Virgina C. Ohio	B. South Carolina D. North Carolina
5. Water is important because all living things need it to _____ .	A. swim in C. cook	B. survive D. make paper
6. What percentage of earth's freshwater is readily available for our use?	A. .6% C. 6%	B. 1.6% D. 66%
7. Water is not a limited and precious resource.	A. true	B. false
8. Water is a clear liquid that is _____, _____, and tasteless.	A. colorless C. odorless	B. weightless D. a. and c.
9. What is an area of land that sheds or drains water into a stream, river, or lake?	A. mountain C. tributary	B. river D. watershed
10. In what watershed do we live?	A. Missouri River C. Colorado River	B. New River D. Yukon River